Biomolecular condensates in cellular stress and disease

S-01.9-1

S. Alberti[I]

[I]TU Dresden, Dresden, Germany

Stress-inducible biomolecular condensates such as ribonucleoprotein (RNP) granules and DNA damage sites play major roles in cellular organization and physiology. In this talk, I will discuss how the concept of biomolecular condensates has expanded our view of stress responses and has revealed important links to aging-related diseases. I will introduce quantitative bottom-up biochemistry approaches that now allow us to reconstruct multicomponent, active condensates such as RNP granules and DNA damage sites in the test tube. Using these approaches as well as innovative imaging and biophysics, we have gained important insights into the molecular rules underlying condensate assembly, such as the molecular driving forces that govern condensation, the conformational changes underlying assembly and the molecular mechanisms of condensate regulation. I will further discuss how the concept of biomolecular condensates has allowed us to dissect the functions of stress inducible condensates, and I will demonstrate how condensates can be used to sense and respond to changes in the environment and regulate fundamental cellular processes such as protein synthesis and DNA damage repair.